

**Hydrogen Generator by Methane Pyrolysis with Carbon Capture**

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Identification and Significance of Innovation

The primary innovations of the H<sub>2</sub>Gen system are:

1. The methane pyrolysis reactor is specifically designed such that it is not dependant on high single-pass efficiencies (which will make the system robust),
2. It incorporates batch processing modes, cleaning cycles to regenerate the pyrolysis reactor catalyst and remove carbon, and a carbon capture device (which makes it reusable), and,
3. It uses palladium membrane technology to separate the hydrogen from the methane stream (which makes the H<sub>2</sub> effluent 99.999% pure).

Expected TRL Range at the end of Contract : 3

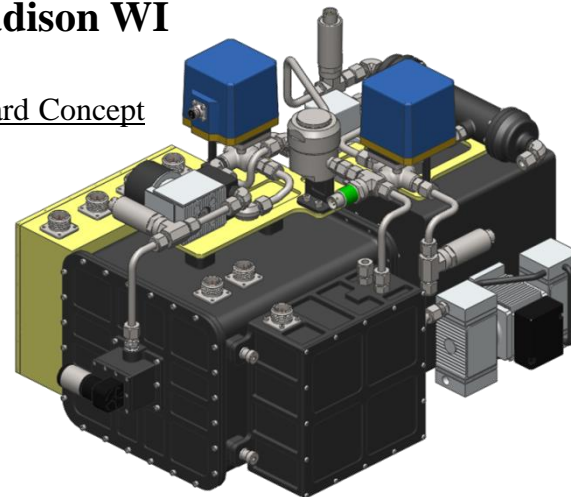
Technical Objectives and Work Plan

The Phase I effort primarily consisted of the fabricating several benchtop test setups to validate the performance of the primary components of the H<sub>2</sub>Gen system.

Specific technical objectives that were met included:

- Fabricate and test methane pyrolysis reactor for efficiency and ability to operate after catalyst regeneration
- Conduct gas analysis on reactor effluent
- Fabricate and test carbon removal mechanism
- Fabricate and test carbon capture device
- Performance test COTS palladium membrane hydrogen separator
- Develop breadboard conceptual design for Phase II

Phase II Breadboard Concept



NASA Applications

When combined with a Sabatier system, the H<sub>2</sub>Gen provides near complete closure of the water loop, an extremely important step towards creating a water-based economy for long-duration manned spaceflight.

Non-NASA Applications

The H<sub>2</sub>Gen system will provide the same role of closing the water loop for commercial aerospace companies such as Bigelow Aerospace as it would for NASA.

Firm Contacts

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